on July 29-30 Mr. Corder had seen a shower of twenty meteors from the point 29° + 56°, which no doubt represented the first on-coming of the Perseids.

The night of August 10 at Mr. Corder's station was very hazy and generally overcast, so that though he was watching during the three hours preceding midnight, he estimated that his observation was not more than an equivalent to one hour of clear sky. He reckoned that under favourable conditions of the atmosphere the Perseids were falling at the rate of 40 per hour. Only one meteor he saw on the 10th was a fine one about = 1. It appeared at 11h. 23m. rather low in Ursa It was rich orange in colour, with a long narrow streak broken in the middle. On August 11 Mr. Corder found meteors scarce; the shower had evidently fallen off considerably. The horary numbers found at Bristol were 26 of all meteors and 17 of Perseids, which very closely corresponds with Mr. Corder's figures, for, observing for three hours, he saw 76 meteors, amongst which were 50 Perseids. He mentions several instances in which the Perseid streaks were broken, and the same feature was frequently observed at Bristol. In such cases the nucleus had several maxima, and the streak-producing power seemed intensified at the point of each outburst.

Mr. Corder mentions a bright aurora as visible on the 11th and 12th instant. They were seen at Bristol also, but the phenomenon of the 12th was by far the most conspicuous. At about 10h. 20m. there was a vivid arch of crimson light spanning the horizon below the stars $\beta - \gamma$ of Ursa Major, and the whole northern quadrant was aglow with streamers. But it soon lost its striking character, though there were indications of streamers at a much later period, and an auroral glow was apparent above the north-west horizon as late as 14h. It was also seen by the Rev. S. J. Johnson at Mitcheldean, Glos., who writes:—"On the 12th there was a somewhat striking display of aurora. It began at 10h. 29m., and was bounded on the east by Capella, and on the west by Arcturus. The columns were often very vivid, but the brilliant character of the phenomenon only lasted 12 minutes."

Major Tupman observing at Cookham, near Maidenhead, Berks, reports the weather very cloudy on August 8, after 11h. 34m. In one hour (10h. 34m.—11h. 34m.) 13 meteors were seen, of which all but 2 were Perseids. August 9 very clear, and the sky watched from 9h. 56m. to 12h. 5m., when 31 meteors were seen, including 28 Perseids and 3 Cygnids. August 10—watch sustained from 9h. 5m. to 10h. 43m., when 15 or 16 Perseids were noted, and a few other small meteors. Sky clouded up at 10h. 43m. August 11 cloudy. Partly clear at 10h. 55m., and 3 Perseids observed, but at 11h. 9m. it again became overcast, and prevented further observation. The radiant point derived from a number of very accurately observed paths on August 9 was at 44° + 56°, with indications of a sub-radiant 4° higher in declination.

The Rev. G. T. Ryves, of Stoke-on-Trent, writes as follows:—

"August 8—10h. to 11h.—19 meteors seen, of which not more than 10 or 11 were Perseids. Soon after 11h. clouds formed, and interrupted further watching.

August 9, 9h. 45m. to 11h., 65 meteors seen.
,, 11h. to 12h. 45m., 30 meteors seen.

"From 80 to 85 were Perseids. The falling off in numbers after 11h. is only apparent, as up to that time I had been assisted by two pairs of eyes, and owing to my defective sight many of the smaller meteors would have escaped me afterwards.

"August 10, 9h. 30m. to 11h. 30m., 126 meteors seen. Nearly all of these were Perseids. During the whole of this period I was assisted by the two young observers above alluded to. Several brilliant meteors were recorded. On August 9, 12h. 25m., one was imperfectly seen in the Milky Way near horizon, in S.W., moving about S.W." This is obviously the same as one described at Bristol at 12h. 23m. the same night.

Another was seen by Mr. Ryves at 12h. 35m., August 9, moving very slightly west of, and parallel to, the stars δ and γ of Cygnus, and at 11h. 2m., August 10, a fine meteor shot towards Aquila, the end point being noted slightly below and west of Altair. These meteors were evidently Perseids, though Mr. Ryves saw only a small proportion of brilliant meteors. He remarks: "The most noticeable feature in this year's display has been the great falling off in the average brightness of the meteors as compared with former years. Of the 240 meteors seen here not more than a dozen were such as would have attracted the attention of any one but trained observers, the great majority requiring rather exceptionally keen eyes to detect them at all."

Mr. Cornish, at Debenham, Suffolk, gives the following summary of watches between August 1 and 12:—

	Meteors.	Observers.
August 1, 10h. 15m. to 11h. 40m. ...	13 ...	V. Cornish
9, 10h. to 11h.	23 ...	H. Heather
9, 10h. 40m. to 11h.	13 ...	V. Cornish
11, 9h. 48m. to 11h. 38m. ...	56 ...	V. Cornish
12, 9h. 3m. to 9h. 33m.	6 ...	H. Heather

On the 11th no less than 24 were noted during the first half-hour's observation. The sky was partly cloudy after 11h. A 1st mag. stationary meteor was seen at 348½ − 23 on August 4, at 13h. 48m. On August 9, 10h. 23m., a meteor = Sirius shot from 0° + 37° to 349° + 28°, and it appears to be identical with a fine meteor registered by Mr. Ryves at Stoke-on-Trent, August 9, 10h. 25m., path from α Andromedæ to α Pegasi. Mr. Cornish remarks that "the recent display of Perseids was not equal to that of last year, even supposing the circumstances to have been as favourable." It must be remembered, however, that on the all-important night of August 10 few observations could be obtained, owing to the generally unfavourable state of the sky, and that under these conditions a comparison cannot fairly be instituted. Mr. Corder estimated the horary rate of Perseids as 40 per hour on the 10th; and at Bristol, where the stars could only be seen in dim outline through the fog-laden atmosphere, the number actually counted at an early period of the night was 28 per hour. This compares favourably with the last successful observation of this shower obtained by the writer in 1877, when, with a perfectly clear sky, 57 Perseids were noted between 9½h. to 11h., = 38 per hour. Making allowance for the difference of weather, the recent display, though it cannot be regarded as in any way exceptional, may yet be classed as a fairly active return of the shower; and it is fortunate that on the several nights immediately preceding and following the 10th, the state of the sky allowed its progress to be traced with unusual distinctness.

The Rev. S. J. Johnson, at Abbenhall Rectory, Mitcheldean, Glos., saw 20 meteors during an hour's watch (10h. 57m. to 11h. 57m.) on August 9. The following night there was much cloud about at times, especially in the eastern sky, so that only 16 meteors were seen between 10h. 3m. and 11h. 3m. On the 11th the night was very clear, and 12 meteors seen between 10h. and 11h. Mr. Johnson gives a list of the brighter meteors, which includes several nearly equal to Jupiter, and many 1st magnitude.

The night of the 9th appears to have been very favourable at all stations, and more shooting-stars were seen on that date than on the 10th, when the sky was in part overcast. On the 11th there was a very evident falling-off in the number of meteors observed at Chelmsford and Bristol, the horary rate of apparition of the Perseids being noted as 17 at both places. The following night it had fallen to 8, and on the 13th to 5, as derived from observations at Bristol, and the absolute cessation of the shower was evidently near at hand.

W. F. DENNING

INTERNATIONAL METEOROLOGY

THE International Meteorological Committee appointed by the Congress of Rome held its first meeting at the Observatory, Berne, from the 9th to the 12th ultimo. All the members of the Committee, nine in number, were present. Their names are as follows:—

Prof. H. Wild (president), Mr. R. H. Scott (secretary), Professors Buys Ballot and Cantoni, Capt. de Brito Capello, Professors Hann, Mascart, and Mohn, and Dr. Neumayer. The following is a brief notice of the most interesting results of the meeting:—

The International Comparison of Standard Instruments.—The original scheme for this undertaking was based on the supposition that thirty-six European observatories would take part in it, each paying a contribution of about 15*l*. The number of acceptances of the proposal up to the date of the meeting was, however, insufficient to justify the Committee in commencing the comparison, and it was therefore determined to recommend each country to carry out a careful comparison of its own standard instruments with those of neighbouring countries.

The International Simultaneous Observations.—The proposal recently made by the Chief Signal Office, Washington, to change

the time of this observation from oh. 43m. to oh. 8m. p.m. was discussed, and it was resolved to accede to the proposal, notwithstanding the inconvenience which the change might entail in individual systems of observation.

The Proposal for Concerted Arctic Observations.—The International Polar Commission appointed at Hamburg, in October, 1879, presented a report of a meeting it had recently held at Berne, and announced that Count Wilczek and Lieut. Weyprecht had consented to postpone their expedition to Nova Zembla until 1882 in order to allow of more time for the organisation of the other expeditions destined to co-operate with them. The International Committee resolved to aid the scheme by all the means in their power.

The Publication of Data referring to Rain, &c.—A proposal made by Dr. Köppen for an improved method of publication of information relating to rain, snow, &c., was ordered to be circulated among the different observatories, in order to obtain opinions as to its suitability.

Telegraphic Communication with the Atlantic Islands.—Capt. Hoffmeyer submitted a resolution as to the desirability of laying cables to the Faroes, Iceland, Greenland, and to the Azores. The Committee expressed their hope that it might be found possible to lay these cables, which would be of very great importance for the weather service of Europe.

The Publicaeion of Average Values for Meteorological Data.—The Committee, at Capt. Hoffmeyer's suggestion, recommended that all meteorological organisations should publish regularly the mean values for the most important elements for the telegraphic and international stations.

The Catalogue of Meteorological Literature.—A proposal made by Dr. Hellmann of Berlin for the preparation of such a catalogue was considered. Dr. Hellmann stated that he had calculated the cost of preparation of the catalogue of printed books and memoirs at about 550*l.*, and that of printing and publication (1,000 copies) at about 750*l.*

Several of the members of the Committee promised to aid in carrying out the scheme, if it were seriously undertaken, by the preparation of catalogues of the literature which exists in their own individual languages. The subject was finally referred to Mr. Scott and Dr. Hellmann, with power to act if they found sufficient encouragement.

As to the catalogue of unpublished records of observations, no definite resolution was adopted.

International Tables for the Reduction of Observations.—It was stated that a publishing firm in Leipzig was prepared to print and publish such tables at its own risk if the "copy" were delivered to them. The subject was referred to Prof. Mascart and Prof. Wild for the preparation of a definite plan for the calculation of the tables.

The Committee will include in its Report, which will shortly appear, a notice of the progress made in each country in carrying out the resolutions of the Congress of Rome.

It only remains to say that the members of the Committee were most hospitably entertained by the Federal Council and by the Municipality of Berne.

AGRICULTURAL CHEMISTRY[1]

SOME of my predecessors in this chair, whose duties as teachers of chemistry lead them to traverse a wide range of the subject every year, have appropriately and usefully presented to the Section a *résumé* of the then recent progress in the manifold branches of the science which have now such far-reaching ramifications. Some, on the other hand, have confined attention to some department with which their own inquiries have more specially connected them.

But it seems to me that there is a special reason why I should bring the subject of 'Agricultural Chemistry before you on the present occasion. Not only is the application of chemistry to agriculture included in the title of this Section, but in 1837 the Committee of the Section requested the late Baron Liebig to prepare a report upon the then condition of Organic Chemistry, and it is now exactly forty years since Liebig presented to the British Association the first part of his report, which was entitled "Organic Chemistry in its Applications to Agriculture and Physiology"; and the second part was presented two years later, in 1842, under the title of "Animal Chemistry, or Organic Chemistry in its Application to Physiology and Pathology." Yet, so far as I am aware, no President of the Section has, from that time to the present, taken as the subject of his address the Application of Chemistry to Agriculture.

Appropriate as, for these reasons, it would seem that I, who have devoted a very large portion of the interval since the publication of Liebig's works, above referred to, to agricultural inquiries, should occupy the short time that can be devoted to such a purpose in attempting to note progress on that important subject, it will be readily understood that it would be quite impossible to condense into the limits of an hour's discourse anything approaching to an adequate account, either of the progress made during the last forty years, or of the existing condition of agricultural chemistry.

For what is agricultural chemistry? It is the chemistry of the atmosphere, the chemistry of the soil, the chemistry of vegetation, and the chemistry of animal life and growth. And but a very imperfect indication of the amount of labour which has been devoted of recent years to the investigation of these various branches of what might at first sight seem a limited subject will suffice to convince you how hopeless a task it would be to seek to do more than direct attention to a few points of special interest.

From what we now know of the composition and of the sources of the constituents of plants, it is obvious that a knowledge of the composition of the atmosphere and of water was essential to any true conception of the main features of the vegetative process; and it is of interest to observe that it was almost simultaneously with the establishment, towards the end of the last century, of definite knowledge as to the composition of the air and of water, that their mutual relations with vegetation were first pointed out. To the collective labours of Black, Scheele, Priestly, Lavoisier, Cavendish, and Watt, we owe the knowledge that common air consists chiefly of nitrogen and oxygen, with a little carbonic acid; that carbonic acid is composed of carbon and oxygen; and that water is composed of hydrogen and oxygen; whilst Priestly and Ingenhousz, Sennebier and Woodhouse, investigated the mutual relations of these bodies and vegetable growth. Priestly observed that plants possessed the faculty of purifying air vitiated by combustion or by the respiration of animals; and, he having discovered oxygen, it was found that the gaseous bubbles which Bonnet had shown to be emitted from the surface of leaves plunged in water consisted principally of that gas. Ingenhousz demonstrated that the action of light was essential to the development of these phenomena; and Sennebier proved that the oxygen emitted resulted from the decomposition of the carbonic acid taken up.

De Saussure concluded that air and water contributed a much larger proportion of the dry substance of plants than did the soils in which they grew. In his view a fertile soil was one which yielded liberally to the plant nitrogenous compounds, and the incombustible or mineral constituents; whilst the carbon, hydrogen, and oxygen, of which the greater proportion of the dry substance of the plant was made up, were at least mainly derived from the air and water.

Perhaps I ought not to omit to mention here that, each year for ten successive years, from 1802 to 1812, Sir Humphry Davy delivered a course of lectures on the "Elements of Agricultural Chemistry," which were first published in 1813, were finally revised by the author for the fourth edition in 1827, but have gone through several editions since. In those lectures Sir Humphry Davy passed in review and correlated the then existing knowledge, both practical and scientific, bearing upon agriculture. He treated of the influences of heat and light; of the organisation of plants; of the difference, and the change, in the chemical composition of their different parts; of the sources, composition, and treatment of soils; of the composition of the atmosphere, and its influence on vegetation; of the composition and the action of manures; of fermentation and putrefaction; and finally of the principles involved in various recognised agricultural practices.

With the exception of these discourses of Sir Humphry Davy, the subject seems to have received comparatively little attention, nor was any important addition made to our knowledge in regard to it during the period of about thirty years from the date of the appearance of De Saussure's work in 1804 to that of the commencement of Boussingault's investigations.

In 1837 Boussingault published papers on the amount of gluten in different kinds of wheat, on the influence of the clearing of forests on the diminution of the flow of rivers, and on the

[1] Opening Address in Section B (Chemical Science), at the Swansea meeting of the British Association, by J. H. Gilbert, Ph.D., F.R.S., V.P.C.S., F.L.S., President of the Section.